

The Smectic A-Chiral Nematic Transition in Mixtures of 8OCB and CB15

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It is well established that the smectic A-nematic transition (NA transition) is continuous, unless a crossover to first order behaviour is caused by the influence of the nematic order parameter on the smectic order parameter if the nematic region is sufficiently small[1]. The question remains whether the smectic A-chiral nematic (i.e. cholesteric) transition (N*A transition) will show similar behavior whether the chirality will cause this transition to be first order.

To investigate this, we have studied mixtures of nonchiral 8OCB with chiral CB15 using high resolution adiabatic scanning calorimetry (ASC). This technique can not only be used to determine the specific heat capacity, but can also perform a direct measurement of the enthalpy as a function of temperature, from which the latent heat of a first order transition can be obtained.

It is well known that the NA transition in pure 8OCB, which has a nematic width of about 13K, is continuous[2]. We have found that in mixtures with CB15, the N*A transition is weakly first order. Because the width of the chiral nematic region increases with increasing molar fraction of chiral CB15, this cannot be attributed to a crossover as in the case of the NA transition, and must as a consequence be caused by the increasing chirality. The evolution of the latent heats and transition temperatures as a function of increasing molar fraction of CB15 will be compared with theory [3].

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